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Gazetteer of Hydrologic Characteristics of Streams in Massachusetts--Housatonic River Basin

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U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 84-4285

Prepared in cooperation with the
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATER POLLUTION CONTROL

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GAZETTEER OF HYDROLOGIC CHARACTERISTICS OF STREAMS IN MASSACHUSETTS--HOUSATONIC RIVER BASIN

By S. William Wandle, Jr., and Robert G. Lippert

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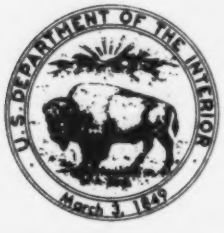

Boston, Massachusetts

1984

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

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CONVERSION FACTORS

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI Units
	Length	
inch (in)	25.4*	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
	Slope	
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)

Temperature

Temperature in degrees Fahrenheit (^oF) can be converted to degrees Celsius (^oC) as follows:

$$^oC = 5/9\ (^oF-32).$$

*Exact.

GAZETTEER OF HYDROLOGIC CHARACTERISTICS OF STREAMS IN MASSACHUSETTS--HOUSATONIC RIVER BASIN

By S. William Wandle, Jr., and Robert G. Lippert

ABSTRACT

The Housatonic River basin includes streams that drain 504 square miles in western Massachusetts and 30.5 square miles in eastern New York above the Massachusetts-Connecticut State line. Drainage areas, using the latest available 1:24,000 scale topographic maps, were computed for the first time for ungaged streams draining more than 3 square miles and were re-computed for data-collection sites.

Streamflow characteristics for four gaging stations were calculated using a new data base with daily flow records through 1981. These characteristics include annual and monthly flow statistics, duration of daily flow values, and the annual 7-day mean low flow at the 2-year and 10-year recurrence intervals. Seven-day low-flow statistics are presented for 52 partial-record sites, and procedures used to determine the hydrologic characteristics of a basin are summarized. Basin characteristics representing 14 commonly used indices to estimate various streamflows are provided for selected gaging stations. This gazetteer will aid in the planning and siting of water-resources related activities and will provide a common data base for governmental agencies and the engineering and planning communities.

INTRODUCTION

Information on hydrologic characteristics, including drainage areas, frequency of low flows, and duration of daily flows, is necessary to plan and manage water-resources related activities. Governmental agencies and the engineering and planning community need streamflow and basin characteristics to satisfy requirements relative to waste assimilation, fisheries management, hydropower, land-use planning, stream-systems analysis, and water-resource

development and management. No current hydrologic data base containing a comprehensive list of drainage areas, monthly flows, low-flow frequencies, and duration of daily flows is available for most of the Massachusetts stream systems. Drainage areas are available for selected sites where streamflow data are collected. Streamflow characteristics are presented in various reports, but these data, to be current, need to be re-analyzed using the latest available daily flow records.

In response to this need, a study was begun in 1980, in cooperation with the Massachusetts Division of Water Pollution Control, to analyze available streamflow and river-basin characteristics, and to compute subbasin drainage areas. This report is part of a series of gazetteers on the hydrologic characteristics of the major river basins in the State. Gazetteers are also available for the coastal river basins of the North Shore and Massachusetts Bay (Wandle, 1984a), Connecticut River basin (Wandle, 1984b), Hudson River basin (Wandle, 1984c), Merrimack River basin (Wandle and Fontaine, 1984), Taunton and Ten Mile River basins (Wandle and Keezer, 1984), Blackstone River basin (Wandle and Phipps, 1984), Thames River basin (Wandle and LeBlanc, 1984), and coastal river basins of the South Shore and Buzzards Bay (Wandle and Morgan, 1984). This report provides the first comprehensive list of drainage areas and streamflow characteristics derived from daily flow records in the Housatonic River basin. The streamflow characteristics presented are an expansion and an update of those given in Norvitch and others, (1968).

The Housatonic River basin drains an area of 1,946 mi^2 above its mouth in Long Island Sound (Connecticut), of which 504 mi^2 are within Berkshire County in western Massachusetts (fig. 1). The study area includes all or part of the following communities: Alford, Becket, Cheshire, Dalton, Egremont, Great Barrington, Hancock, Hinsdale, Lanesborough, Lee, Lenox, Monterey, Mount Washington, New Ashford, New Marlborough, Otis, Peru, Pittsfield, Richmond, Sandisfield, Sheffield, Stockbridge, Tyringham, Washington, West Stockbridge, and Windsor.

Streamflow characteristics presented for the four continuously gaged streams are based upon a new sample of daily flow records in comparison to flow records used in Norvitch and others (1968), Higgins (1967), Knox and Soule (1949), and Male and Ogawa (1982). Streamflow records through the 1981 water year were available for this analysis. For each site, records were selected to represent a flow regime influenced by fairly constant river-basin conditions (Wandle, 1983).

Drainage areas were computed for the first time for ungaged streams draining greater than 3 mi^2 and were re-computed for data-collection sites. Drainage divides, as delineated on the latest available 1:24,000 scale topographic quadrangle maps (Wandle, 1981; Gadoury and Wandle, 1982a, 1982b) were used to calculate drainage areas. Drainage areas for most of the continuously gaged streams in earlier reports were computed using the drainage divides as outlined on 1:31,680 or 1:62,500 scale topographic quadrangle maps.

Streamflow data used in this study are a part of the historic streamflow data collected under agreements with State and Federal agencies and the U.S. Geological Survey. Most of the low-flow discharge measurements used in determining low-flow estimates at partial-record sites were collected during the water-resources investigation of the Housatonic River basin (Norvitch and others, 1968). The file of basin characteristics was created during an evaluation of available streamflow data in central New England (Johnson, 1970). This file is an expansion of the characteristics abstracted by Langbein and others (1947), and by Benson (1962). Basin characteristics were updated and additional characteristics were entered as part of a study to define floodflow characteristics of small streams (Johnson and Tasker, 1974, and Wandle, 1982). The hierarchical stream list was compiled by the Massachusetts Division of Water Pollution Control and the Massachusetts Division of Fisheries and Wildlife (Halliwell and others, 1982).

Data tabulated include drainage areas, basin and streamflow characteristics for gaging stations, including annual and monthly flow statistics, duration of daily flow values, and the annual 7-day mean low flow at the 2-year and 10-year recurrence intervals. Seven-day low-flow statistics for partial-record sites are also presented. An explanation of each procedure to determine the streamflow and basin characteristics is provided.

The authors thank the many persons who have kindly given time, information, and guidance during this study. Particular thanks are given to persons in the Geological Survey who assisted in the preparation of this report.

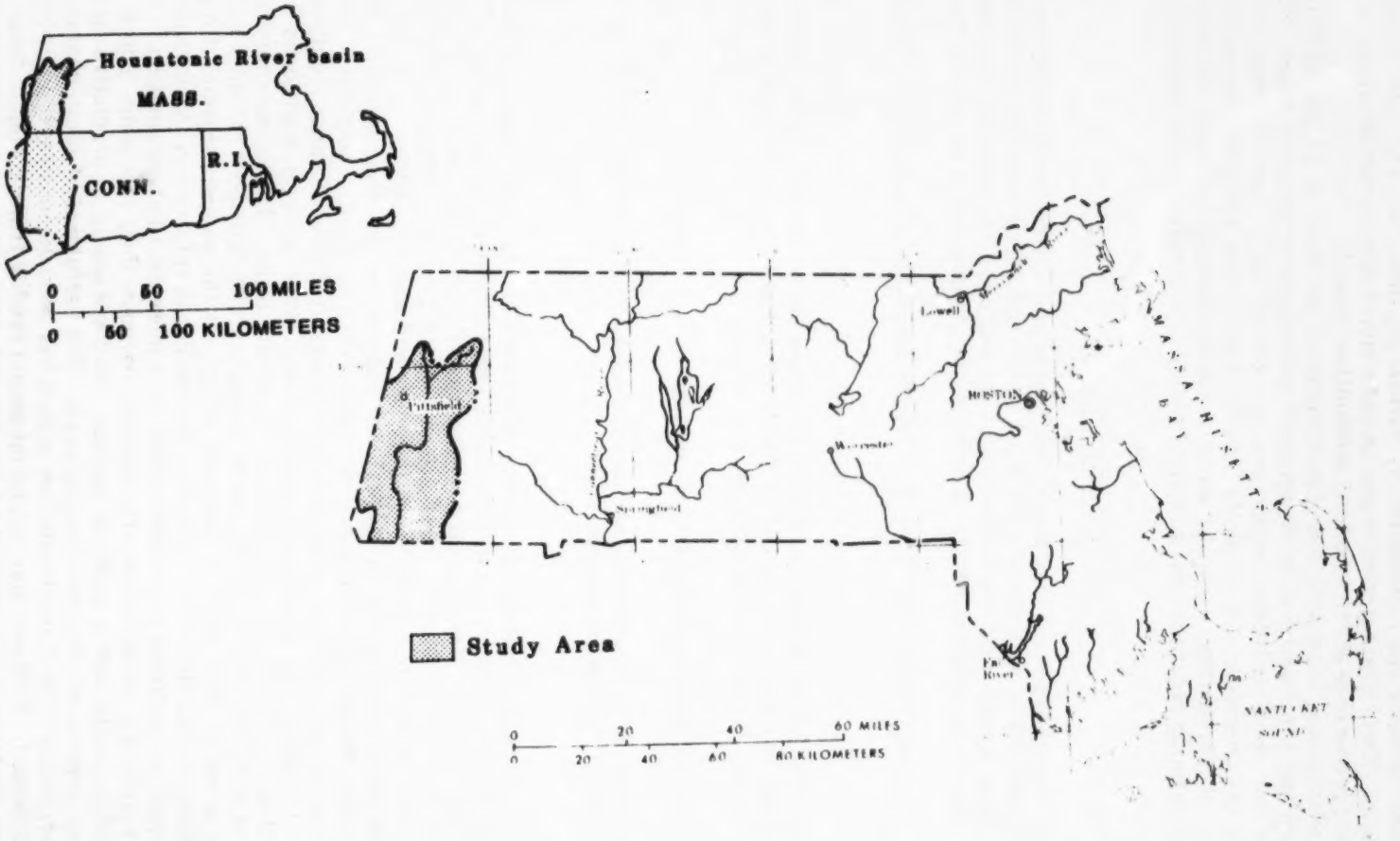

Figure 1.--Location of the Housatonic River basin

HYDROLOGIC DATA

Hydrologic characteristics are represented by various physical, climatic, and streamflow indices of a river basin. These characteristics can be determined either from available maps by following standardized procedures or from historic streamflow records.

Basin characteristics are indices of the physiography of the basin or of the climate prevailing over the basin and are measured on topographic quadrangle or climatic maps. Streamflow characteristics are computed from continuous records of daily flow or from a set of measurements during the occurrence of a specific event. Streamflow and basin characteristics are used in modeling stream quality, assessing water-resources conditions, analyzing impact of man's activities, and defining relationships to estimate flows or stream-quality parameters at ungaged sites.

Basin Characteristics

Drainage area is one of the most important variables in any hydrologic investigation or in the design of riverine structures because it is the most significant variable in the northeast that influences all streamflow, except perhaps low flow in some regions. The physical boundary for many water-related studies corresponds to the limits for the drainage area upstream from the site.

For this study, drainage areas listed in table 1 (at the end of the report) were determined for the following sites:

1. Survey data-collection sites shown in figure 2. These sites include continuous-record gaging stations given in table 2 (at the end of the report), low-flow partial-record stations, miscellaneous sites, and water-quality stations.

2. Locations where the drainage area is greater than 3 mi^2.

3. Successive sites along a stream where the area between sites is at least 6 mi^2 on tributary streams and 10 mi^2 on the Housatonic River.

The drainage basin divides for these sites were delineated on the latest available 1:24,000 scale topographic quadrangle maps. Subbasin drainage divides are shown in the series of statewide reports, "Drainage Divides, Massachusetts." The Housatonic River basin is covered by three reports—Hudson River basin (Wandle, 1981), Housatonic River basin (Gadoury and Wandle, 1982a), and Westfield and Farmington River basins (Gadoury and Wandle, 1982b).

The subbasin drainage areas given in table 1 are indexed to the Massachusetts stream inventory prepared by the Massachusetts Division of Water Pollution Control and the Massachusetts Division of Fisheries and Wildlife (Halliwell and others, 1982) with some modification. Drainage areas were computed for sites meeting one of the three criteria mentioned above. The entire stream listing is included as a reference for stream order. This hierarchical listing begins at the mouth of a major stream and proceeds upstream with tributary streams indented under the main-stem stream. This order is followed to list all the named streams. Unnamed trib- utaries are included to maintain the hierarchy. The reader is referred to the inventory of rivers and streams report by Halliwell and others (1982) for a more detailed explanation.

The basin characteristics listed below are included because they represent indices that would remain reasonably stable over a planning period. They are useful in predictive surface-water models to assess impacts of proposed developments. The usefulness of these characteristics to explain the variability of various streamflow events has been demonstrated in hydrologic analyses (Thomas and Benson, 1970) and they can be measured readily from available maps. The 14 basin indices given in table 3 (at the end of the report) were computed according to the procedures described below. The indices for elevation, storage, lake area, and forest can be computed by the grid method which is explained after all the procedures are described.

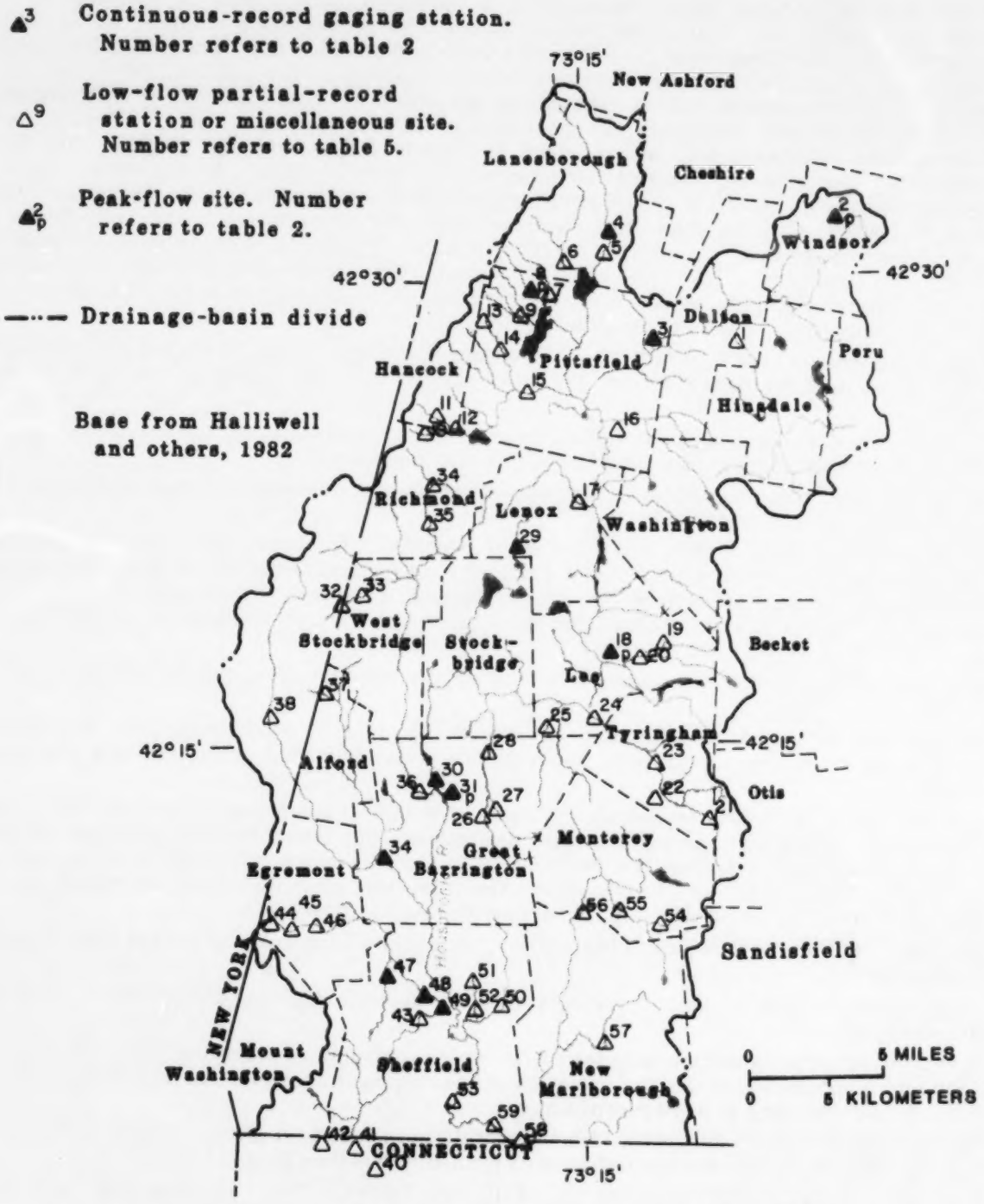

Figure 2.--Location of the gaging stations and low-flow partial-record stations in the Housatonic River basin

1. Drainage area—Area, in square miles, as measured on the most recent 1:24,000 scale topographic quadrangle maps. Drainage area, as defined in the "National Handbook of Recommended Methods for Water-Data Acquisition" (U.S. Geological Survey, 1977), is "...the area of a river basin, measured in a horizontal plane, that is enclosed by a topographic divide such that direct surface runoff from precipitation normally would drain by gravity into the river basin.". Drainage area boundary lines are traced on topographic maps along divides indicated by contour elevations, starting at the point on the stream for which the drainage area is desired. These lines are drawn to cross a contour at right angles. Interpolation between contours may be indicated by reference to trails, old roads, or firebreaks in forested areas, all of which frequently follow drainage divides. Detailed information may also be obtained from highway or street profiles, from examination of aerial photographs, and from ground reconnaissance. Subareas within each quadrangle map were computed with an electronic digitizer using the procedures of the U.S. Federal Inter-Agency River Basin Committee (1951) as a guide. The coefficients to compute square miles from digitizer units were calculated using the known area of each 7.5-minute quadrangle or of the appropriate 2.5-minute quadrilaterals. Drainage areas for the subbasins were computed by summing the contributing areas.
2. Slope—Main-channel slope, in feet per mile, determined from elevations at points 10 percent and 85 percent of the distance along the main channel from the gaging station to the basin divide.
3. Length—Main-channel length, in miles, from the gaging station to the basin divide, as measured with dividers set to 0.1 mile or with a map measurer.
4. Elevation—Mean basin elevation, in feet above sea level, measured on topographic maps by laying a grid over the map.
5. Storage—Area of lakes, ponds, and marshes, in percent of total drainage area, measured by planimetering or by using a transparent grid. The marsh area includes the area of wooded marshes and marshes as defined by the appropriate topographic quadrangle map symbol. Storage area is the total area of all the lakes, ponds, and marshes expressed as a percentage of the total drainage area.
6. Lake area—Area of lakes and ponds, in percent of the drainage area, determined by the grid method.
7. Forest—Area of forest, in percentage of the drainage area, determined from the forest cover as shown on the topographic map with the green woodland overprint using the grid method.
8. Soil—Soil index, in inches, represents the value of potential maximum infiltration, during an annual flood, under average soil-moisture conditions. This characteristic, provided by the U.S. Soil Conservation Service (Dr. Benjamin Isgur, written commun., 1970), is a function of the soil and cover conditions in the basin. The index was computed from the runoff curve number following procedures in U.S. Department of Agriculture (1972).
9. Latitude—Latitude of stream-gaging station, in decimal degrees, determined by manual measurement.
10. Longitude—Longitude of stream-gaging station, in decimal degrees, determined by manual measurement.
11. Precipitation—Mean-annual precipitation, in inches, determined from the isohyetal map in Knox and Nordenson (1955). The variation in mean-annual precipitation is shown in more detail in this map than in more recent sources.
12. Precipitation intensity—Maximum 24-hour rainfall, in inches, having a recurrence interval of 2 years. This characteristic was determined from U.S. Weather Bureau (1959b).
13. Snowfall—Average total seasonal snowfall, in inches, from an isohyetal map in Lautzenheiser (1969).
14. January temperature—Minimum January temperature, in degrees Fahrenheit, determined from U.S. Weather Bureau (1959a).

Several basin characteristics were measured following the grid method by using transparent grids to compute area or an average contour value. Storage area is determined by randomly placing the grid over the water and marsh area and counting squares. If the water and marsh area is large enough (about 30 squares), the number of grid intersections within the storage area are counted. The storage area then is computed as the product of the square size and the number of grid intersections. To measure a contour value such as elevation, the grid spacing is selected to give at least 25 intersections within the basin boundary. The elevation at each grid intersection is determined and an average is computed. The percentage of a variable that is extensive in a drainage basin, such as forest cover, can be easily measured by counting the number of grid intersections occurring over the forested area, multiplying by 100, and dividing by the number of grid intersections within the basin.

Streamflow Characteristics

Historic daily flow records available in the Housatonic River basin were used to compute daily, monthly, and annual flow characteristics. A summary of these records is given in table 2 and the location of streamflow sites is shown in figure 2. These flow data were collected as part of the Survey's nationwide data-collection network through agreements with State and Federal agencies. Records of daily flow are available from the Survey's National Water Data Storage and Retrieval System (WATSTORE). This water-data computer processing system consists of several files containing data grouped by common characteristic and data-collection frequency.

The WATSTORE system includes site identification, daily values files, and computer programs that produce streamflow statistics. Hydrologic-data files are maintained for (1) parameters measured on a daily or continuous basis, such as streamflow values, river stages, water temperatures, specific-conductance values, and ground-water levels; (2) annual peak values for streamflow and stage; (3) chemical analyses for surface- and ground-water sites; and (4) ground-water site inventory, including location, identification and geohydrologic characteristics. The data-processing, storage, retrieval, and analysis capabilities of WATSTORE are described in the system user's guide compiled by Hutchison (1975). Information regarding the availability of data analyses may be obtained from: U.S. Geological Survey, 150 Causeway Street, Suite 1309, Boston, MA 02114.

A brief description of the streamflow statistics computed using the WATSTORE system is included below. Streamflow characteristics representing annual, monthly, and daily flow statistics were selected for this analysis because they are useful in planning and design studies in this region. The streamflow statistics computed following the procedures given below are listed in table 4 (at the end of the report).

Annual and monthly flow characteristics (means and standard deviations) were computed at four gaging stations with the "Daily Values Monthly and Annual Statistics" computer program W4422 (Price and Meeks, 1977) using observed daily flow records. The maximum and minimum, monthly means (fig. 3 and table 4) were obtained from output provided by this program. The monthly hydrograph for the Housatonic River near Great Barrington is shown in figure 3.

Characteristics of the flow-duration curve (the daily mean flow exceeded 99, 95, 90, 75, 70, 50, 25, and 10 percent of the time) for four gaging stations were computed by means of computer program A969, "Daily Values Statistics" (Meeks, 1977). An example of a flow-duration curve for Housatonic River near Great Barrington is given in figure 4. Low-flow characteristics (annual 7-day mean low flows at the 2-year and 10-year recurrence intervals, 7Q2 and 7Q10, respectively) at four gaging stations were also calculated by program A969. In this program, a log-Pearson Type III distribution is fitted to a set of observed annual 7-day mean low flows to obtain coordinates of the computed low-flow frequency curve. If the log-Pearson Type III curve did not adequately fit a plot of the observed data, especially in the low end, then a graphical curve was drawn. The graphical frequency curve was used to interpret the observed data when necessary because a graphical curve is the basic curve to use in analyzing the frequency of annual low flows according to Riggs (1971, 1972). The frequency curve for Green River near Great Barrington is shown in figure 5.

Additional flow data, including flood-frequency analyses, are available from WATSTORE. Peak discharges for selected recurrence intervals for 82 sites in Massachusetts are given in Wandle (1982).

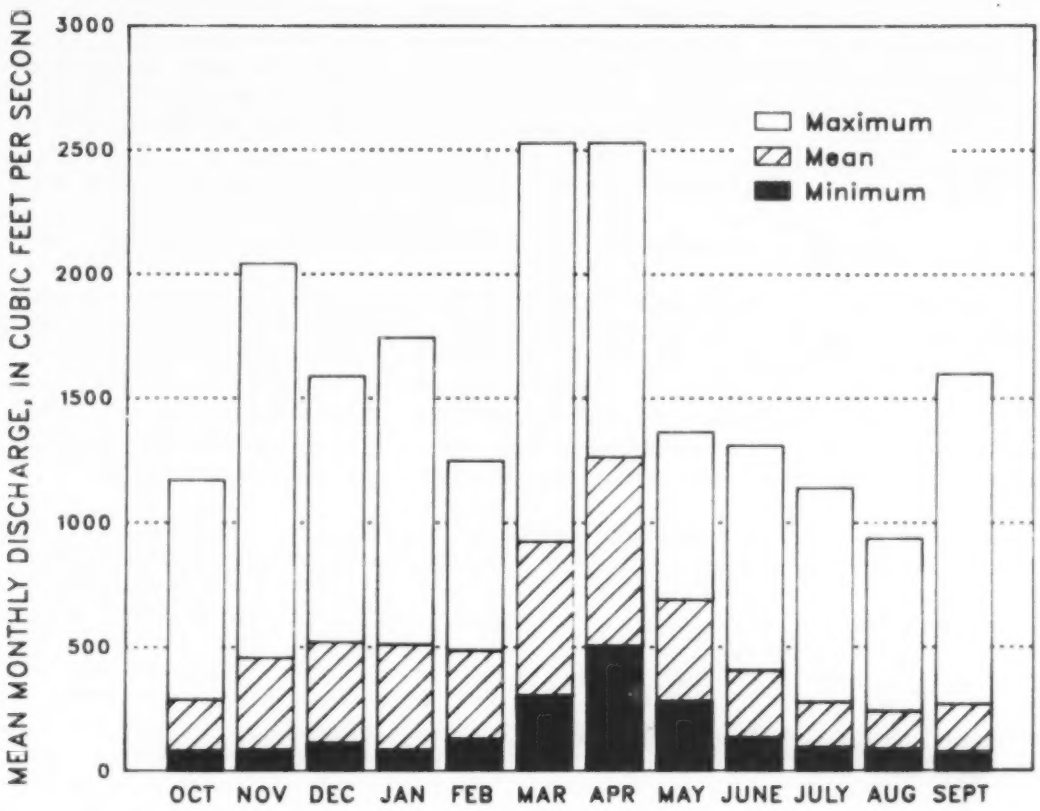

Figure 3.--Monthly discharges and extremes for the Housatonic River near Great Barrington, Mass. (site 30), during 1914-81

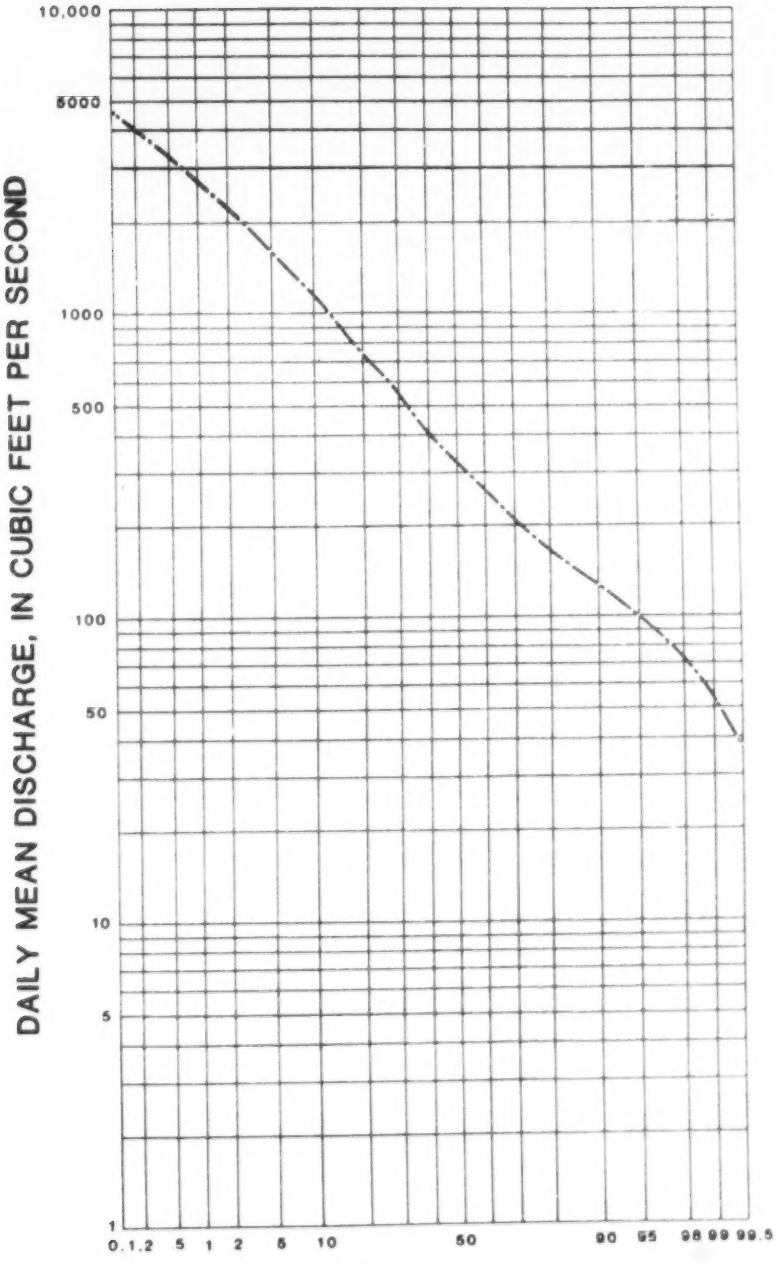

Figure 4.--Flow-duration curve for the Housatonic River near Great Barrington, Mass. (site 30), during 1914-81

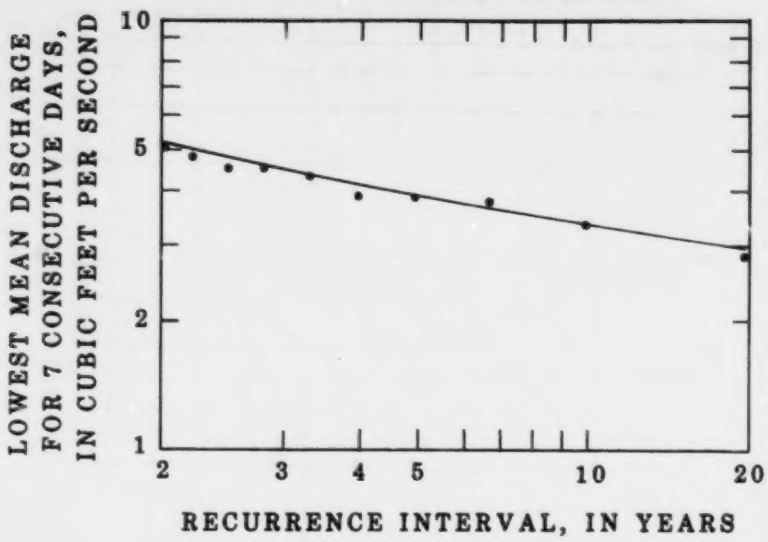

Figure 5.—Low-flow frequency curve for the Green River near Great Barrington, Mass. (site 39), during 1952-71

Characteristics of low flow were also determined at low-flow partial-record stations where measurements of discharge, rather than a continuous daily flow record, were available. This estimating technique is briefly described in the section on Streamflow Analysis. The 7-day low-flow statistics were developed from discharge measurements made during periods of base runoff. Base runoff is defined (Langbein and Iseri, 1960) as "the sustained or fair weather runoff. In most streams, base runoff is composed largely of ground-water effluent." Base runoff usually occurs in most Massachusetts streams during the summer or early fall after 5 to 7 consecutive days without rainfall.

STREAMFLOW ANALYSIS

Streamflow Data Base

Systematic records of daily streamflow have been collected since 1914 in the Housatonic River basin. The location and period of record for these gaging stations are given in table 2. Streamflow records are available for sites in the Connecticut portion of the basin from the U.S. Geological Survey office in Hartford, Connecticut.

Discharge measurements were made at 43 low-flow partial-record sites during the water-resources investigation of the Housatonic River basin (Norvitch and others, 1968). Measurements were also collected as part of the Massachusetts low-flow network at two sites during 1965 and two sites from 1978 and 1981. Data are available as part of the Connecticut water-resources program for streams draining into the Housatonic River basin in Massachusetts. Discharge measurements were made for two sites on Schenob Brook at Taconic, Connecticut and for Konkapot River at Canaan, Connecticut.

Flow characteristics are useful in resource management and design studies if these variables represent a particular natural flow regime or the regulated flow sequence that is expected to occur in the future. A valid streamflow analysis is based upon flow records during a period of relatively constant river-basin conditions.

Daily Flow Statistics

Systematic daily flow records available for eight sites in the Housatonic River basin were reviewed to select a data base for statistical analysis. Impacts of reservoirs, diversions, regulation, and withdrawals for public supplies on streamflows were assessed using information on stream regulation found in the series of water-resources data reports issued annually (see U.S. Geological Survey, 1980, for an example) and in Knox and Soule (1949). Streamflow records for four sites were selected that represent a flow regime influenced by fairly constant river-basin conditions (Wandle, 1983). The record length used in this analysis is given in table 4. Low flow, monthly flow, and flow-duration characteristics given in table 4 were derived from the observed streamflow records at each station and were not adjusted for regulation or diversion. These daily streamflow characteristics were computed following procedures summarized in the section on streamflow characteristics.

Low-Flow Statistics

Continuous streamflow records are not necessary to estimate low-flow characteristics at sites. According to Riggs (1972), selected base-flow measurements rather than a continuous daily flow record can define the low-flow characteristics at a site.

Low-flow partial-record stations are operated to collect discharge measurements when streamflow is composed largely of ground-water runoff. These low-flow sites are selected on streams where: (1) flow is not affected by artificial regulation, (2) flow is not influenced by pumping from large capacity wells located adjacent to the stream channel, and (3) flow is expected to occur during a significant dry spell. Base-flow measurements to define a relation with concurrent gaged flows are obtained over several low-flow periods.

A relation is developed with the base-flow measurements and the concurrent daily mean flows at a nearby unregulated long-record gaging station (index station). The 7-day low-flow statistics (7Q2 and 7Q10) for the partial-record site are determined from this relation using the appropriate low-flow statistics for the gaged stream. This estimating technique is explained in more detail by Riggs (1972).

Low-flow statistics for 52 sites are summarized in table 5 (at the end of the report). The low-flow statistics are representative of the hydrologic regime during the data-collection period. Seven-day, 2-year, and 10-year low flows ranged from 0 to 0.33 and from 0 to 0.23 $(ft^3/s)/mi^2$, respectively, at these sites. North Branch Hoosic River at North Adams was used as the index station. These values were computed following the procedures mentioned above.

SUMMARY

Drainage areas were computed for the first time for ungaged streams draining greater than 3 mi^2, and were re-computed for data-collection sites. Basin characteristics for drainage area, slope, length, elevation, storage, lake area, forest, soil, latitude, longitude, precipitation, precipitation intensity, snowfall, and January minimum temperature are provided for nine sites in the Housatonic River basin. Computer programs A969 and W4422 were used to determine daily flow statistics at four gaging stations including annual and monthly flows, duration of daily flows, and 7-day low-flow values. Seven-day, 2-year, and 10-year low flows ranged from 0 to 0.33 and from 0 to 0.23 $(ft^3/s)/mi^2$, respectively, at the 52 partial-record stations.

Techniques used to compute basin and streamflow characteristics of a river basin are summarized. This gazetteer contains a comprehensive listing of hydrologic characteristics that should prove useful to those concerned with water-resources activities.

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the Housatonic River basin

[Sites with streamflow information listed in tables 2, 4, or 5 are marked with an asterisk. The hierarchical listing is modified from Halliwell and others, 1982. Drainage areas are shown for sites as explained in the section on basin characteristics. These areas are not adjusted for manmade changes in the flow system. Streams entirely in adjacent states are underlined and are included in the list where necessary to maintain the stream order.]

Stream name	Location	Drainage area, in square miles
HOUSATONIC RIVER BASIN		
Housatonic River		
Blackberry River (Conn.)		
Duming Brook (Conn.)		
Whiting River		
Ginger Creek		
Whiting River	Thousand Acre Swamp outlet	4.48
Konkapot River	Relocated U.S. Route 7	*61.1
Konkapot River	State Route 124	*59.3
Squabble Brook (Conn.)		
Brewer Brook		
Umpachene River	Southfield Road	*8.55
Konkapot River	Hayes Hill Road	36.5
Konkapot River	Downstream from Lake Buel on unnamed road	29.1
Konkapot River	Opposite fish hatchery on Hatchery Road	*23.5
Swann Brook		
Rawson Brook	Unimproved dirt Road off Gould Road	*8.33
Harmon Brook		
Rawson Brook	Upstream from Wallace Hall Road	*2.38
Loom Brook		
Unnamed tributary	Lake Garfield outlet	3.95
Housatonic River	Andrus Road	*473
Ironwork Brook		
Soda Creek	Country Road	*2.56
Soda Creek	Fink Road	*1.58
Ironwork Brook	County Road	*8.27
Hubbard Brook	U.S. Route 7	*49.9
Schencb Brook	Berkshire School Road	*23.3
Dry Brook		
Race Brook		
Bear Rock Stream		
Sages Ravine Brook	300 feet upstream from tributary	*3.41
Schenob Brook	300 feet downstream from Washinee Lake	*7.18
Schenob Brook	Hammertown Road	*7.81
Hubbard Brook	Cook Road	*25.8
Willard Brook	Berkshire School Road	*3.20

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the Housatonic River basin (Continued)

Stream name	Location	Drainage area, in square miles
HOUSATONIC RIVER BASIN (Continued)		
Housatonic River (Continued)		
Hubbard Brook (Continued)		
Unnamed tributary	Mill Pond outlet	10.2
Karner Brook		
Fenton Brook	Mt. Washington Road	*2.94
Karner Brook	Jug End Road	*2.27
Karner Brook	150 feet upstream from private road	*1.79
Housatonic River	Kellogg Road	394
Green River	250 feet downstream from Hurlburt Street	*51.0
Seekonk Brook	Mouth	18.6
Long Pond Brook	Mouth	2.18
Alford Brook	Mouth	12.2
Tom Ball Brook	2000 feet upstream from mouth	*1.95
Scribner Brook	State Route 71	2.55
Unnamed tributary	Mouth	3.82a
Westover Brook (N. Y.)	Unnamed road off State Route 22, New York	*11.8a
Cranse Creek (N. Y.)	0.25 mile west of State Route 22, New York	8.61a
Green River	State Route 22, New York	3.26a
Green River	Division Street	*42.5
Williams River	Shaker Mill Pond outlet	31.8
Williams River	Mouth	10.8
Cone Brook	Mouth	1.98
Lenox Mountain Brook	600 feet upstream from Swamp Road	*5.74
Cone Brook	Sleepy Hollow Road	*3.91
Cone Brook		
Fairfield Broook		
Sleepy Hollow Brook	State Route 102	6.88
Flat Brook	West Center Road	*2.63
Baldwin Brook	40 feet downstream from small stone dam	*2.24
Baldwin Brook	Furnace Road	4.25
Furnace Brook	State Route 183	*.67
Housatonic River tributary	Highway bridge	*282
Housatonic River		
Mohawk Brook	Mouth	15.1
Larrywaug Brook	Stockbridge Bowl outlet	11.7
Larrywaug Brook	Mouth	6.33
Lily Brook	Hawthorne Street	*2.12
Marsh Brook	U.S. Route 7	13.2
Konkapot Brook		
Agawam Brook		

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the Housatonic River basin (Continued)

Stream name	Location	Drainage area, in square miles
HOUSATONIC RIVER BASIN (Continued)		
Housatonic River (Continued)		
Konkapot Brook	Alcott Street	*6.42
Stony Brook	Private road	*2.11
Muddy Brook	Stony Brook Road	*2.63
Housatonic River	U.S. Route 7	246
Kampoosa Brook		
Marsh Brook		
Beartown Brook	0.25 mile upstream from Meadow Street	8.80
West Brook	Beartown Mountain Road	*4.11
East Brook		
Hop Brook	Meadow Street	*22.1
Mad River		
Merry Brook		
Crystal Brook		
Hop Brook	Main Road	*14.0
Camp Brook		
Hop Brook tributary	Monterey Road	*.76
Hop Brook	150 feet upstream from Sodem Pond	*4.05
Willow Brook		
Housatonic River		
Goose Pond Brook		
Greenwater Brook	Private bridge near U.S. Route 20	*7.64
Basin Pond Brook	Interstate Route 90	*3.14
Unnamed tributary	Goose Pond outlet	3.99
Cooper Brook		
Higley Brook		
Housatonic River trib. No. 2	East Street	*.73
Unnamed tributary	Downstream from U.S. Route 20	3.42
Sargent Brook		
Codding Brook	Greylock Street	2.30
Commons Brook		
Washington Mountain Brook	Mouth	8.93
Housatonic River	Walker Street	172
Woods Crossing Brook		
Willow Creek		
Sawmill Brook		
Yokun Brook	East Street	*5.95
Mill Brook		
Roaring Brook	October Mountain Road	5.91
Unnamed tributary	Sandwash Reservoir outlet	1.75
Housatonic River	New Lenox Road	148
Sykes Brook	East New Lenox Road	*.81
Sackett Brook	East New Lenox Road	8.77
Ashley Brook	Mouth	3.27
Hathaway Brook		

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the Housatonic River basin (Continued)

Stream name	Location	Drainage area, in square miles
HOUSATONIC RIVER BASIN (Continued)		
Housatonic River (Continued)		
Unnamed tributary		
Wampenum Brook		
East Branch Housatonic River	Mouth	70.8
Brattle Brook		
Unkamet Brook		
Barton Brook	South Street	1.12
East Branch Housatonic River	40 feet downstream from Hubbard Avenue	*57.6
East Branch Housatonic River	South Street	55.8
Walker Brook		
East Branch Housatonic River	Center Pond outlet	53.1
Wahconah Falls Brook	Mouth	19.4
Wahconah Falls Brook	Windsor Reservoir outlet	15.0
Anthony Brook		
Weston Brook		
Windsor Brook	Mouth	9.09
Windsor Brook	Downstream from Tyler Brook	6.64
Tyler Brook		
Windsor Brook tributary	State Route 9	*.30
Cady Brook	Mouth	3.87
Cleveland Brook	Cleveland Brook Reservoir outlet	1.15
East Branch Housatonic River	0.5 mile upstream from East Housatonic Street	*27.0
Frisell Brook	Plunkett Reservoir outlet	2.95
Unnamed tributary		
Welsh Brook		
Russo Brook		
Bennett Brook	Middlefield Road	10.4
Tracy Brook		
Kilburn Brook		
Bennett Brook	Ashmere Lake outlet	3.98
Cady Brook	Pittsfield Road	4.06
East Branch Housatonic River	Penn Central Railroad	4.06
Bilodeau Brook		
West Branch Housatonic River	U.S. Route 20	36.5
Onota Brook	Onota Lake outlet	10.5
Parker Brook	Churchill Street	*3.19
Lulu Brook		
Hawthorne Brook		
Churchill Brook	Churchill Street	*1.16
Daniels Brook	Hancock Road	*2.66
West Branch Housatonic River	Pontoosuc Lake outlet	21.8
Secum Brook	Balance Rock Road	*5.73
Hollow Brook		

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the Housatonic River basin (Continued)

Stream name	Location	Drainage area, in square miles
HOUSATONIC RIVER BASIN (Continued)		
Housatonic River (Continued)		
West Branch Housatonic River (Continued)		
Town Brook	Miner Road	*11.5
Town Brook	Bridge Street	*10.6
Town Brook	Unnamed road off State Route 7	4.32
Southwest Branch Housatonic River	Mungerford Street	*20.4
Maloy Brook		
Smith Brook	West Street	*2.49
Smith Brook	200 feet upstream of small pond	*1.05
Jacoby Brook		
May Brook	Mouth	1.88
Lilly Brook	Mouth	1.85
Shaker Brook		
Southwest Branch Housatonic River	Richmond Pond outlet	7.57
Mount Lebanon Brook		
Seace Brook		
Mount Lebanon Brook	Berkshire Downs Road	*1.23
North Branch Mount Lebanon Brook	U.S. Route 20	*.46
Mount Lebanon Brook	Behind State storage pit	*.56

a Drainage basin is outside of Massachusetts.

Table 2.—Summary of daily flow records and peak-flow records available in the Housatonic River basin

Number in figure 2	Station number	Station name	Location	Period of record	Remarks
2	01196990	Windsor Brook tributary at Windsor, Mass.	State Route 9	1964-74	Peak-flow site, discontinued.
3	01197000	East Branch Housatonic River at Coltsville, Mass.	Hubbard Street	1937-81	Regulated by powerplants and by Cleveland Brook Reservoir since 1949; regulation greater prior to 1955. Diversions from Cleveland Brook Reservoir since 1950 for municipal supply of Pittsfield.
4	01197015	Town Brook at Bridge Street at Lanesborough, Mass.	Bridge Street	1981	
8	01197050	Churchill Brook at Pittsfield, Mass.	Churchill Street	1964-74	Peak-flow site, discontinued.
18	01197155	Housatonic River tributary No. 2	East Street	1965-74	Peak-flow site, discontinued.
29	01197300	Marsh Brook at Lenox, Mass.	Hawthorne Street	1963-74	Discontinued.
30	01197500	Housatonic River near Great Barrington, Mass.	Highway bridge	1914-81	Low flow is regulated by powerplants. High flow is slightly affected by retarding reservoir since 1973.
31	01197550	Housatonic River tributary at Risingdale, Mass.	State Route 183	1963-81	Peak-flow site, discontinued.
39	01198000	Green River near Great Barrington, Mass.	250 feet downstream from Hurlburt Street	1952-71	Discontinued.
43	01198030	Schenob Brook at Sheffield, Mass.	Berkshire School Road	1971-72	Discontinued.
47	01198070	Willard Brook near Sheffield, Mass.	Berkshire School Road	1971-72	Discontinued.
48	01198075	Hubbard Brook at Sheffield, Mass.	Cook Road	1971-72	Discontinued.

Table 3.—Basin characteristics for selected stream-gaging stations in the Housatonic River basin

Basin characteristics	Station name and site number				
	Windsor Brook tributary at Windsor, Mass.	East Branch Housatonic River at Coltsville, Mass.	Town Brook at Bridge Street Lanesborough, Mass.	Churchill Brook at Pittsfield, Mass.	Housatonic River tributary No. 2 at Lee, Mass.
	(2)	(3)	(4)	(8)	(18)
Area, in square miles	0.30	57.6	10.6	1.16	0.73
Slope, in feet per mile	138	47.7	—	432	449
Length, in miles	1.1	14.7	—	2.7	1.4
Elevation, in feet	1900	1680	—	1660	1320
Storage, in percent	0	2.23	—	.0	.0
Lake area, in percent	0	1.21	—	.0	.0
Forest, in percent	28	65	—	88	61
Soils index, in inches	4.0	4.5	—	3.9	3.4
Latitude of gage, in decimal degrees	42.5114	42.4700	42.5200	42.4914	42.3058
Longitude of gage, in decimal degrees	73.0769	73.2000	73.2300	73.2822	73.2303
Precipitation, in inches	47.0	48.1	—	46.0	46.0
Precipitation intensity for 2-year recurrence interval, in inches	3.0	3.0	—	3.0	3.5
Snowfall, in inches	70	65	—	70	65
January minimum temperature, in degrees Fahrenheit	11	11	—	13	11

Table 3.--Basin characteristics for selected stream-gaging stations in the Housatonic River basin (Continued)

Basin characteristics	Station name and site number			
	Marsh Brook at Lenox, Mass. (29)	Housatonic River near Great Barrington Mass. (30)	Housatonic River tributary at Risingdale, Mass. (31)	Green River near Great Barrington, Mass. (39)
Area, in square miles	2.12	282	0.67	51.0
Slope, in feet per mile	161	16.5	4.74	54.2
Length, in miles	2.8	49.7	2.0	15.2
Elevation, in feet	1240	1430	1190	1180
Storage, in percent	5.39	2.07	.0	1.31
Lake area, in percent	.69	1.94	.0	.61
Forest, in percent	60	65	89	71
Soils index, in inches	3.7	3.8	4.1	4.1
Latitude of gage, in decimal degrees	42.3497	42.2300	42.2325	42.1900
Longitude of gage, in decimal degrees	73.2989	73.3600	73.3464	73.3900
Precipitation, in inches	46.0	46.7	44.0	44.2
Precipitation intensity for 2-year recurrence interval, in inches	3.3	2.8	3.5	3.4
Snowfall, in inches	65	65	65	65
January minimum temperature, in degrees Fahrenheit	12	12	12	13

Table 4.—Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations

Annual and monthly flow characteristics:
QA is the mean annual discharge
SDQA is the standard deviation of mean annual discharge
QM is the mean discharge for M calendar month, M = 1 for January where the top line is the maximum mean; the middle line is the mean; the bottom line is the minimum mean.
SDQM is the standard deviation of mean discharge for M calendar month

Low-flow characteristics:
7Q2 is the annual minimum 7-day mean discharge for 2-year recurrence interval
7Q10 is the annual minimum 7-day mean discharge for 10-year recurrence interval

Flow-duration characteristics:
DPT is the daily discharge, exceeded PT percent of the time, from the flow-duration curve

Years of record:
YRSDAY is the number of years of daily flow record for this analysis
YRSLOW is the number of years of low-flow record for this analysis

Flow	Station name and site number			
	East Branch Housatonic River at Coltsville, Mass. (3)	Marsh Brook at Lenox, Mass. (29)	Housatonic River near Great Barrington, Mass. (30)	Green River near Great Barrington, Mass. (39)
ANNUAL				
QA	99.2	4.83	526	79.4
SDQA	31.4	1.47	136	22.0
MONTHLY				
Q10	233	2.81	1170	179
	65.7	13.4	286	33.9
	19.9	.03	80.9	3.06
SDQ10	50.3	.90	213	43.8
Q11	230	9.77	2041	250
	86.0	3.83	455	78.4
	19.1	.15	85.5	3.43
SDQ11	54.9	2.70	334	75.1
Q12	321	12.7	1588	163
	100	5.19	518	88.0
	31.2	.91	112	13.4
SDQ12	66.7	3.76	303	440

Table 4.—Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations (Continued)

Flow	Station name and site number			
	East Branch Housatonic River at Coltsville, Mass. (3)	Marsh Brook at Lenox, Mass. (29)	Housatonic River near Great Barrington, Mass. (30)	Green River near Great Barrington, Mass. (39)
Q1	219	10.9	1744	176
	88.7	3.72	508	75.9
	15.5	.69	83.5	21.0
SDQ1	59.2	3.02	302	40.8
Q2	268	9.73	1249	161
	89.8	4.01	484	81.9
	16.0	1.14	128	33.0
SDQ2	59.2	2.51	260	37.8
Q3	417	24.4	2528	289
	156	9.72	924	155
	50.4	1.94	303	70.7
SDQ3	90.5	5.87	442	60.2
Q4	527	20.8	2529	410
	261	12.4	1265	234
	108	6.64	505	79.5
SDQ4	111	4.86	509	99.8
Q5	264	22.8	1365	184
	126	7.73	687	104
	43.8	2.08	281	41.5
SDQ5	55.3	5.72	269	38.2
Q6	326	9.18	1312	142
	72.9	3.85	404	47.1
	25.4	.37	134	12.7
SDQ6	68.6	3.13	254	36.0
Q7	194	7.42	1140	102
	46.2	2.21	276	20.3
	12.9	.25	93.4	6.43
SDQ7	36.8	2.52	203	21.2
Q8	155	5.53	937	78.0
	46.4	1.54	239	17.1
	14.9	.08	86.8	4.22
SDQ8	36.0	1.77	170	19.3

Table 4.—Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations (Continued)

Flow	Station name and site number			
	East Branch Housatonic River at Coltsville, Mass. (3)	Marsh Brook at Lenox, Mass. (29)	Housatonic River near Great Barrington, Mass. (30)	Green River near Great Barrington, Mass. (39)
Q9	156	2.42	1601	71.3
	51.4	1.06	268	19.1
	15.1	.06	75.1	3.57
SDQ9	40.9	.72	243	19.3
LOW FLOW				
7Q2	18.2	.06	106	5.3
7Q10	11.4	.00	69.0	3.3
FLOW DURATION				
D99	13.6	.01	52.0	3.4
D95	18.2	.08	97.7	4.9
D90	22.5	.27	126	6.6
D75	32.8	.93	189	15.4
D70	36.3	1.2	210	19.5
D50	56.2	2.5	332	43.4
D25	111	6.1	646	101
D10	218	12.4	1190	192
YEARS				
YEARSDAY	25	12	69	20
YRSLOW	24	11	67	20

Table 5.--Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites

Number in figure 2	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		HOUSATONIC RIVER BASIN					
1	01196980	[1]East Branch Housatonic River near Dalton, Mass.	0.5 mile upstream from East Housatonic Street	1963-64	27.0	—	—
5	01197020	[2]Town Brook at Lanesborough, Mass.	Miner Road	1963-65	11.5	0.8	<0.1
6	01197030	Secum Brook near Lanesborough, Mass.	Balance Rock Road	1963-65	5.73	1.9	1.2
7	01197040	Daniels Brook at Pittsfield, Mass.	Hancock Road	1963-65	2.66	.8	.6
8	01197050	Churchill Brook at Pittsfield, Mass.	Churchill Street	1963-65	1.16	.2	<.1
9	01197060	Parker Brook at Pittsfield, Mass.	Churchill Street	1963-65	3.19	.6	.4
10	01197070	Mount Lebanon Brook at Shaker Village, Mass.	Behind State storage pit	1963-65	.56	<.1	<.1
11	01197080	North Branch Mount Lebanon Brook at Shaker Village, Mass.	U.S. Route 20	1963-65	.46	.0	.0
12	01197090	Mount Lebanon Brook near Shaker Village, Mass.	Berkshire Downs	1963-65	1.23	.0	.0
13	01197100	Smith Brook near Brickhouse Mountain Road at Pittsfield, Mass.	200 feet upstream from small pond	1963-65	1.05	.1	<.1
14	01197110	Smith Brook at West Street at Pittsfield, Mass.	West Street	1963-65	2.49	.4	.3

Table 5.—Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figure 2	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		HOUSATONIC RIVER BASIN (Continued)					
15	01197120	Southwest Branch Housatonic River at Pittsfield, Mass.	Mungerford Street	1963-65	20.4	2.3	1.4
16	01197130	Sykes Brook at Pittsfield, Mass.	East New Lenox Road	1963-65	.81	.2	<.1
17	01197140	Yokun Brook near Lenox, Mass.	East Street	1963-65	5.95	.7	.1
18	01197155	Housatonic River tributary No. 2 at Lee, Mass.	East Street	1965	.73	—	—
19	01197170	Basin Pond Brook near East Lee, Mass.	Interstate Route 90	1963-65	3.14	.2	<.1
20	01197180	Greenwater Brook at East Lee, Mass.	Private bridge near State Route 20	1963-65	7.64	1.7	1.2
21	01197200	Hop Brook near Tyringham, Mass.	150 feet upstream from Sodem Pond	1963-65	4.05	.9	.6
22	01197210	Hop Brook near Tyringham, Mass.	Monterey Road	1963-65	.76	<.1	<.1
23	01197220	Hop Brook at Tyringham, Mass.	Main Road	1963-65	14.0	1.7	1.0
24	01197230	Hop Brook near South Lee, Mass.	Meadow Street	1963-65	22.1	2.6	1.5
25	01197240	West Brook near South Lee, Mass.	Beartown Mountain Road	1964-65	4.11	<.1	<.1
26	01197250	Muddy Brook near Great Barrington, Mass.	Stony Brook Road	1963-65	2.63	.6	.5

Table 5.—Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figure 2	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		HOUSATONIC RIVER BASIN (Continued)					
27	01197260	Stony Brook near Great Barrington, Mass.	Private road	1963-65	2.11	<0.1	0.0
28	01197280	Konkapot Brook near Great Barrington, Mass.	Alcott Street	1963-65	6.42	.5	.3
31	01197550	Housatonic River tributary at Risingdale, Mass.	State Route 183	1965	.67	—	—
32	01197600	Baldwin Brook near State Line, Mass.	40 feet downstream from stone dam	1963-65	2.24	.3	.0
33	01197650	Baldwin Brook at West Center Road near State Line, Mass.	West Center Road	1963-65	2.63	.4	.0
34	01197700	Cone Brook at Sleepy Hollow Road near Richmond, Mass.	Sleepy Hollow Road	1963-65	3.91	.2	.0
35	01197750	Cone Brook near Swamp Road near Richmond, Mass.	600 feet upstream from Swamp Road	1963-65	5.74	.5	<.1
36	01197800	Williams River near Great Barrington, Mass.	Division Street	1963-65	42.5	7.7	4.3
37	01197960	Scribner Brook near Alford, Mass.	2000 feet upstream from mouth	1963-65	1.95	.4	<.1
38	01197930	Green River at Green River, N.Y.	Unnamed road off State Route 22	1963-65	11.8	1.6	1.0

Table 5.—Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figure 2	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		HOUSATONIC RIVER BASIN (Continued)					
39	01198000	[3]Green River near Great Barrington, Mass.	250 feet downstream from Hurlburt Street	1980-81	51.0	5.3	3.3
40	01198010	Schenob Brook Taconic, Conn.	300 feet downstream from Washinee Lake	1963-64	7.18	—	—
41	01198015	Schenob Brook Taconic, Conn.	Hammertown Road	1966-67	[4]7.81	—	—
42	01198020	Sages Ravine Brook near Taconic, Mass.	300 feet upstream from tributary	1963-65	3.41	.6	.5
43	01198030	[3]Schenob Brook at Sheffield, Mass.	Berkshire School Road	1978-81	23.3	.6	.2
44	01198040	Karner Brook near Mt. Washington Road, near South Egremont, Mass.	150 feet upstream from private road	1963-65	1.79	.4	.4
45	01198050	[5]Karner Brook at Jug End Road, near South Egremont, Mass.	Jug End Road	1963-65	2.27	—	—
46	01198060	Fenton Brook near South Egremont, Mass.	Mt. Washington Road	1963-65	2.94	.5	<.1
49	01198080	[1]Hubbard Brook at Route 7 at Sheffield, Mass.	State Route 7	1963-65	49.9	—	—
50	01198100	Ironworks Brook near Sheffield, Mass.	County Road	1963-65	8.27	.1	<.1

Table 5.—Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figure 2	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		HOUSATONIC RIVER BASIN (Continued)					
51	01198110	Soda Creek at Fink Road near Sheffield, Mass.	Fink Road	1963-65	1.58	0.1	<0.1
52	01198120	[6]Soda Creek at County Road near Sheffield, Mass.	County Road	1963-65	2.56	<.1	.0
53	01198130	[1]Housatonic River at Ashley Falls, Mass.	Andrus Road	1963-64	473	—	—
54	01198140	Rawson Brook near Wallace Hall Road near Monterey, Mass.	Upstream from Wallace Hall Road	1963-65	2.38	.3	.2
55	01198150	Rawson Brook near Monterey, Mass.	Unimproved dirt road off Gould Road	1963-65	8.33	1.0	.6
56	01198155	Konkapot River at Hartsville, Mass.	Opposite fish hatchery on Hatchery Road	1964-65	23.5	4.5	3.5
57	01198160	Umpachene River at Southfield, Mass.	Southfield Road	1963-65	8.55	.9	.5
58	01198190	Konkapot River near Canaan, Conn.	State Route 124	1963-67	[4]59.3	—	—
59	01198200	Konkapot River at Ashley Falls, Mass.	Relocated U.S. Route 7	1963-65	61.1	16.6	14.0

[1] Regulated.
[2] Suspected influence by pumping.
[3] Recording gage, see table 2.
[4] From Thomas, 1972.
[5] Diversions for water supply.
[6] Evapotranspiration exceeded runoff during low-flow periods.

SELECTED REFERENCES

Benson, M. A., 1962, Factors influencing the occurrence of floods in a humid region of diverse terrain: U.S. Geological Survey Water-Supply Paper 1580-B, 64 p.

Gadoury, R. A., and Wandle, S. W., Jr., 1982a, Drainage divides, Massachusetts--Housatonic River basin: U.S. Geological Survey Open-File Report 82-634, 12 maps.

_____1982b, Drainage divides, Massachusetts--Westfield and Farmington River basins: U.S. Geological Survey Open-File Report 82-635, 15 maps.

Halliwell, D. B., Kimball, W. A., Screpetis, A. J., 1982, Massachusetts stream classification program, part I, Inventory of rivers and streams: Massachusetts Department of Environmental Quality Engineering and Department of Fisheries, Wildlife, and Recreational Vehicles, 126 p., appendix consisting of 3 pages.

Higgins, G. R., 1967, Yield of streams in Massachusetts: Amherst, Massachusetts, University of Massachusetts, Water Resources Research Center Publication 5, 175 p.

Hutchison, N. E., compiler, 1975, WATSTORE--National water data storage and retrieval system of U.S. Geological Survey--User's guide: U.S. Geological Survey Open-File Report 75-426, 791 p. (revised).

Johnson, C. G., 1970, A proposed streamflow data program for central New England: U.S. Geological Survey open-file report, 38 p., 1 appendix consisting of 11 pages.

Johnson, C. G., and Tasker, G. D., 1974, Progress report on flood magnitude and frequency of Massachusetts streams: U.S. Geological Survey Open-File Report 74-131, 41 p.

Knox, C. E., and Nordenson, T. J., 1955, Average annual runoff and precipitation in the New England-New York area: U.S. Geological Survey Hydrologic Investigations Atlas HA-7, 6 p.

Knox, C. E., and Soule, R. M., 1949, Hydrology of Massachusetts, part 1, Summary of streamflow and precipitation records: U.S. Geologial Survey Water-Supply Paper 1105, 240 p.

Langbein, W. B. and Iseri, K. T., 1960, General introduction and hydrologic definitions, in Manual of hydrology, part 1, General surface-water techniques: U.S. Geological Survey Water-Supply Paper 1541-A, p. 1-29.

Langbein, W. B., and others, 1947, Topographic characteristics of drainage basins: U.S. Geological Survey Water-Supply Paper 968-C, p. 125-157.

Lautzenheiser, R. E., 1969, Snowfall, snowfall frequencies, and snow cover data for New England: Environmental Sciences Services Administration Technical Memorandum EDSTM 12, 15 p.

Male, J. W., and Ogawa, H., 1982, Low flows of Massachusetts streams: Amherst, Massachusetts, University of Massachusetts, Water Resources Research Center Publication 125, 152 p.

Meeks, W. C., 1977, Daily values statistics (program A969), in Hutchison, N. E., compiler, 1975, WATSTORE--National water data storage and retrieval system of the U.S. Geological Survey user's guide: U.S. Geological Survey Open-File Report 75-426 (revised), chap. IV, section G.

Norvitch, R. F., Farrell, D. F., Pauszek, F. H., and Petersen, R. G., 1968, Hydrology and water resources of the Housatonic River basin, Massachusetts: U.S. Geological Survey Hydrologic Investigations Atlas HA-281.

Price, W. E., Jr., and Meeks, W. C., 1977, Daily values monthly and annual statistics (program W4422), in Hutchison, N. E., compiler, 1975, WATSTORE—National water data storage and retrieval system of the U.S. Geological Survey user's guide: U.S. Geological Survey Open-File Report 75-426 (revised), chap. IV, section F.

Riggs, H. C., 1971, Discussion of probability distribution of annual droughts by Eratakulan S. Joseph: American Society of Civil Engineers Proceedings, v. 97, no. IR3, p. 540-541.

_____1972, Low-flow investigations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 4, chap. B1, 18 p.

Thomas, D. M., and Benson, M. A., 1970, Generalization of streamflow characteristics from drainage-basin characteristics: U.S. Geological Survey Water-Supply Paper 1975, 55 p.

Thomas, M. P., 1972, Gazetteer of natural drainage areas of streams and water bodies within the State of Connecticut: Connecticut Department of Environmental Protection Bulletin No.1, 89 p.

U.S. Department of Agriculture, 1972, Soil Conservation Service National Engineering Handbook, section 4, Hydrology: U.S. Department of Agriculture, Soil Conservation Service.

U.S. Federal Inter-Agency River Basin Committee, Subcommittee on Hydrology, 1951, Inter-agency coordination of drainage area data, notes on hydrologic activities: Water Resources Council, Subcommittee on Hydrology Bulletin no. 4, 48 p.

U.S. Geological Survey, 1977, National handbook of recommended methods for water-data acquisition: U.S. Geological Survey, chap. 7, 38 p.

_____1980, Water resources data for Massachusetts and Rhode Island, water year 1979: U.S. Geological Survey Water-Data Report MA-RI-79-1, 349 p.

U.S. Weather Bureau, 1959a, Climates of the states, Massachusetts: U.S. Weather Bureau, Climatography of the United States, Paper No. 60-19, 20 p.

_____1959b, Rainfall intensity-frequency regime, northeastern United States: U.S. Weather Bureau Technical Paper no. 29, 35 p.

Wandle, S. W., Jr., 1982, Estimating peak discharges of small, rural streams in Massachusetts: U. S. Geological Survey Open-File Report 80-676, 33 p.

_____1983, Low-flow frequency and flow-duration analysis of natural-flow streams in Massachusetts: Boston Society of Civil Engineers Section, American Society of Civil Engineers Journal, v. 69, no. 1, p. 87-110.

_____1984a, Gazetteer of hydrologic characteristics of streams in Massachusetts—coastal river basins of the North Shore and Massachusetts Bay: U.S. Geological Survey Water-Resources Investigations Report 84-4281.

_____1984b, Gazetteer of hydrologic characteristics of streams in Massachusetts—Connecticut River basin: U.S. Geological Survey Water-Resources Investigations Report 84-4282.

_____1984c, Gazetteer of hydrologic characteristics of streams in Massachusetts—Hudson River basin: U.S. Geological Survey Water-Resources Investigations Report 83-4250.

Wandle, S. W., Jr., and Fontaine, R. A., 1984, Gazetteer of hydrologic characteristics of streams in Massachusetts—Merrimack River basin: U.S. Geological Survey Water-Resources Investigations Report 84-4284.

Wandle, S. W., Jr., and Keezer, G. R., 1984, Gazetteer of hydrologic characteristics of streams in Massachusetts—Taunton and Ten Mile River basins and coastal river basins of Mount Hope Bay, Narragansett Bay, and Rhode Island Sound: U.S. Geological Survey Water-Resources Investigations Report 84-4283.

Wandle, S. W., Jr., and LeBlanc, J. A., 1984, Gazetteer of hydrologic characteristics of streams in Massachusetts—Thames River basin: U.S. Geological Survey Water-Resources Investigations Report 84-4287.

Wandle, S. W., Jr., and Morgan, M. A., 1984, Gazetteer of hydrologic characteristics of streams in Massachusetts—coastal river basins of the South Shore and Buzzards Bay: U.S. Geological Survey Water-Resources Investigations Report 84-4288.

Wandle, S. W., Jr., and Phipps, A. F., 1984, Gazetteer of hydrologic characteristics of streams in Massachusetts—Blackstone River basin: U.S. Geological Survey Water-Resources Investigations Report 84-4286.

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